

**Determining Response Mapping Needs for Montgomery County, Maryland
Fire and Rescue Services**

Fire Service Financial Management

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Abstract

No strategic plan existed in the Montgomery County Fire and Rescue Services for how response maps would be developed and managed. As a result, maps were developed in each individual company leading to inconsistent quality, lack of standardization and lack of overall support. Furthermore, an increasing emergency and administrative workload throughout the county reduced the amount of time available to the members developing maps. In addition, the fire and rescue service moves its members around daily to cover short-term vacancies caused by various leave and scheduling needs making it is necessary to have an accurate and standardized response map system so members can determine how to plan their route for emergency response.

The purpose of this research was to assess and document the response mapping needs of the Montgomery County Department of Fire and Rescue Services to serve as the foundation for a strategic plan for short and long term response map development and maintenance. This study used the descriptive research methodology.

The research questions answered were:

1. What are Montgomery County, Maryland's fire and rescue response map needs?
2. What kind of problems do mapping personnel experience in producing maps?
3. Who performs map development and maintenance?
4. Do response maps affect the fire and rescue mission and life safety?

5. What is Montgomery County's present capability for using computers to create maps and what equipment is available to the personnel who prepare maps?

The descriptive research method was used to review business and organizational literature, with the focus on strategic and financial planning. A survey and focus group were conducted to assess the response map needs of the organization's members. The returned surveys and focus group output were analyzed to determine patterns of respondent's needs. Data from the survey was compiled in data base files, spreadsheets and word processing text form to assist with analysis.

The findings revealed that members of the Montgomery County Fire and Rescue Services required a consistent and standard approach to response maps county wide. However, to achieve this goal it would be necessary to conduct additional study and ultimately develop a detailed strategic plan for how standard mapping would be achieved.

This applied research project led to a list of recommendations that focused on the assessment of response map needs in the Montgomery County Fire and Rescue Services. Seven recommendations were presented which included: 1) Perform research of other metro size fire and rescue departments who have successfully implemented a GIS based response map system, 2) Complete the necessary work to develop a strategic plan providing for a comprehensive response map system,

- 3) Develop written justification for funding support for additional GIS staff, 4) Review the business process of fire station management to determine the level of present

effectiveness in light of the heavy call volume and increases in mandated activities, 5)

Establish a plan for general automation management of all hardware and software

applications used by the fire and rescue services in its business processes, 6) Perform a study into alternatives for training personnel in the use of computers and applications. 7)

Study how the department can reduce the practice of transient staffing (details) which increases the risk of members being unfamiliar with the area where they are working.

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INTRODUCTION

No strategic plan existed in the Montgomery County Fire and Rescue Services for how response maps would be developed and managed. As a result, maps were developed in each individual company leading to inconsistent quality, lack of standardization and lack of overall support. Furthermore, an increasing emergency and administrative workload throughout the county reduced the amount of time available to the members developing maps. In addition, the fire and rescue service moves its members around daily to cover short-term vacancies caused by various leave and scheduling needs making it necessary to have an accurate and standardized response map system so members can determine how to plan their route for emergency response. Response maps can be a critical tool to assuring appropriate response times.

The purpose of this research is to assess and document the response mapping needs of the Montgomery County Department of Fire and Rescue Services to serve as the foundation for a strategic plan for short and long term response map development and maintenance. This study uses the descriptive research methodology.

The research questions to be answered are:

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BACKGROUND AND SIGNIFICANCE

Montgomery County, Maryland is situated on the northwest side of Washington D.C.. The county has a population of approximately 850,000, and has a land area of approximately 500 square miles. It is typical of many suburban areas, in that it has a diversity of people, structures and land use. The county has a range of densely populated urban type areas and sparsely populated rural areas. The transportation network includes: highways and secondary roads, rail road and mass transit subway rail. There are approximately 10,000 different streets in the county.

The County's fire and rescue services are a combination career and volunteer system under the direction of an appointed commission. The career element consists of approximately 900 employees under the management of the Montgomery County, Department of Fire and Rescue Services (DFRS). The volunteer element consists of approximately 750 volunteers in nineteen different incorporated local fire departments. The DFRS provides staffing in various combinations, to the local fire departments. In addition to operational staffing, the county provides various other services to the local fire departments, such as: training, dispatch, funding, budget oversight, apparatus purchase,

facility construction and major technology purchases. The combination service responds from 33 fire and rescue stations. All members are cross trained as Emergency Medical Technician – Basic. They provide Basic Life Support on regular ambulance units strategically located throughout the county in fire stations. Advanced Life Support is provided by fire fighters cross-trained as Emergency Medical Technician – Paramedics who respond on medic units strategically located throughout the county in fire stations. The partnership of services, delivered by the career and volunteer firefighters, is coordinated through an integrated chain of command. The county has adapted a combination of command systems to meet its needs for on scene management.

The Department of Fire and Rescue Services uses a rank classification system common to many other national fire and rescue services. For this research paper it is only necessary to discuss the ranks of District Chief and down. The district chief is charged with the responsibility of providing leadership and supervision to one of five geographic districts. The district chiefs work a 24/48 type work schedule. Each district chief is assigned a duty known as Senior Career Officer (SCO). This responsibility affords liaison between DFRS and the local volunteer fire and rescue departments, which are independently incorporated under a charter with the state. The District Chief is responsible for various work program needs such as, facility and apparatus maintenance, volunteer training, local record keeping, administration and coordination of assets, and response maps, etc. The District Chief/SCO provides oversight and supervision to DFRS members assigned to the stations of the local fire department through a DFRS station commander and other assigned officers. The DFRS station commander is a fire and rescue captain

assigned as the person tasked with managing the overall operations of a fire and rescue station. Beyond the district chief the descending rank structure includes: captain, lieutenant, master fire fighter, fire fighter III, fire fighter II and fire fighter I. For purposes of clarity mapping personnel are any fire and rescue members charged with the duty of providing response maps or other geographic response information.

Montgomery County's Fire and Rescue Services respond to approximately 90,000 incidents per year. Between 1991 and 1997 the number of incidents have increased at a rate of approximately 8% each year. Trends in population growth, planned development and demographics indicate a continued increase in services provided by MCFR through the next 10 years. The county recently completed a master plan and study of priority issues which are intended to establish the strategic plan for dealing with the growth.

For many years county fire and rescue personnel were able to become intimately familiar with their response areas, to the point where regular drivers knew nearly everything there was to know about their response district. However, changes in the work force, rapid growth and development, external and internal service demands, and general societal changes have made it difficult for some personnel to have more than a general familiarity with their areas.

In addition to geographic and societal changes the job of providing fire and rescue protection has become more complex. Increased incident activity, dense development and increased presence of hazards create the need for fire and rescue personnel to have access to timely information and robust reference formats. Personnel have attempted to

stay ahead of development by drawing maps and creating massive reference binders on the apparatus. However, the process of developing and maintaining hard copy maps and street indexes at each company has become a tedious and overwhelming task because of the many other demands on the fire and rescue services.

Some examples of information carried in most apparatus includes: Transportation Maps, displaying: Subway, Rail Road, Highways and Subdivision Roads, water supply diagrams, Maps displaying rivers and stream, Building systems info, Occupancy Hazards, Street direction routes, Plans, Procedures, Protocols, Resource Listings, etc. While all apparatus have some form or another of this information, it is not consistent from one piece to another. The very requirement for our apparatus to respond at a moment's notice anywhere in the county makes it necessary for all apparatus to have access to all available information.

The independent work toward providing maps and geographic information at the company level has not been as effective as it should be and needs improvements to meet future demand. As a result, a number of events began to steer the fragmented mapping efforts to a more centralized approach. Some of these events include:

- Purchase of personal computers and expensive computer aided design programs by the local fire and rescue departments to make maps. These computers had no support, training was not provided and in general they did not always fit the needs of the mapping personnel.

- DFRS reassignment of personnel (in some cases the only mapping members) from station-to-station left some stations without mapping capability.
- The need for maps and geographic information that will be able to migrate to a mobile computing system now under development. Present maps are mostly on paper only. Little of the information is in digital format and scanning the maps as bitmap images is not acceptable.
- The Data Study Group of the Master Plan Priority Issues Study identified maps and geographic information as a high priority for centralization within the county fire and rescue service.
- Another study group on response times identified maps and other geographic information as being key to improving response times by county fire and rescue companies.

It has become apparent that the county must make financial and organizational decisions addressing the need for a systematic approach to providing consistent geographic information to responders. To accomplish this goal, it will be necessary to decide what the system will include, what the costs will be and how the organization will need to change to achieve the goal.

This research will use various analysis tasks commonly found in total quality management processes, as well as procedures for making financial management decisions, to identify the needs of the Montgomery County Fire and Rescue personnel in

regard to response maps. A needs assessment is a small but significant task in the analysis of a problem. The determination of these needs is one way to begin the process for developing an over-all plan. This author has the goal of using the information gained from the research for a number of future uses, including: the basis for communication of our mapping needs to the funding decision makers, a description of how we want our maps to be formatted, requirements for how the digitized maps should be configured for the mobile computing system and as a starting point for the need for a geographic information division within MCFR.

The results of this research are significant to the Montgomery County Fire and Rescue Services in terms of how it will provide the basic requirements for the provision of, and configuration of emergency response maps and ultimately a systematic approach toward providing geographic information for future needs. This research identifies facts and recommendations that will assist the Department in making informed decisions. This research may also be significant to other organizations as they determine their response mapping needs.

This research is relevant to the Fire Service Financial Management course in that one of the areas of the course's focus was on performing analysis before financial and organizational decisions are made. This research employs some tasks contained in the Analysis module of the Fire Service Financial Management course.

LITERATURE REVIEW

A literature search was initiated at the NFA's Learning Resource Center (LRC), the Montgomery Co., Maryland Public Library, and the author's personal library, as well as in the World Wide Web (WWW) and Montgomery County Government Budget Manuals with the goal of discovering literature and completed research that could open up some new ways of thinking about and dealing with the problem. The author had some ideas about the response mapping needs and geographic information systems. These areas seemed to be a good initial focus since the assessment of needs is a function of analysis. The author used organizational processes, including analysis, as a guide in determining the needs. From a research planning perspective, several key search words were used for a database query. The key words used for this phase of research included: quality planning, decision making, financial management, mapping, geographic information, emergency response, response times, computers, maps, geography, records, plans review, municipal government, technology training, local government, and pre-fire planning.

Two applied research projects (ARP) were located at the National Fire Academy Learning Resource Center that dealt with maps and geographic information. Both proved to be useful, with the ARP by Deputy Chief Holmerud (1992) providing many elements of what Montgomery County already had in mind for maps, but it also answered many questions too. On the World Wide Web the author located a paper describing a fire response mapping project for the City of Glendale, California. This paper seemed to be a virtual template for an effective mapping system, and closely resembled the system

established in Solana Beach, Ca., as described in Deputy Chief Holmerud's ARP. In addition to the papers there were numerous business and organizational management books and manuals located in the library and county government offices which proved useful as supporting literature. Another resource for information was an on-line book seller, where the author purchased several books with supporting information about organizational processes.

Two general subject headings were used to document the literature and provide a way to organize ideas. The two headings include 1) organizational processes and 2) mapping and geographic information.

When assembling information from all the readings a conflict developed, the references all used different words to describe the people involved. Some writings refer to the subject as employees, some the end user, some, the worker. Writings about the fire and rescue service refer to the word firefighter. During this research, the author will refer to the person, about which the study is being completed, as the **member**. This works since the research studies groups, and an individual is a member of a group. The writings of others will be quoted with their chosen identification of the individual group member.

The literature review, as indicated above will be arranged around the general areas of organizational processes, then mapping and geographic information. Placing the terms in this order will allow a progression from the general, overall organizational financial management considerations; to the more specific, the program area of mapping. This sequence allows review of the organizational aspects affecting Montgomery County, as

well as to bring in reference to other writings about financial management.

Organizational Processes

Successful achievement of goals in a public safety organization is dependent upon close adherence to established financial requirements. Organizational leaders must be knowledgeable in these principals if they are to be successful. This idea provided the author with a beginning point for this research. Despite completing the coursework for Fire Service Financial Management at the NFA the author felt the necessity to seek additional information about financial management before actually completing the research phase and ultimately the written report. This literature review reflects some thoughts about the management processes affecting the programs the fire organization wants to pursue. In the perspective of this paper the author treats the problem of response map management as a proposed program. In order to receive funding for a program the fire organization's leader must understand and follow the appropriate established guidelines. In Montgomery County there are very clear and specific guidelines which must be followed. The policies are established in law as the County Charter. Montgomery County's Executive established a fiscal policy which must be followed. "Fiscal policy is the set of guidelines used to manage revenues, expenditures and debt." (Montgomery Co. March, 1996, p. 3-1). Montgomery County's fiscal policy requires planning for expenditures, establishment of priorities, and assurances of fiscal controls.

The EFOP course Fire Service Financial Management (FSFM) presents a systematic approach to achieving necessary funding by providing "...the skills, knowledge,

and abilities to manage fiscal activities related to the fire/rescue organization and community.” (NFA, 1996, p. v). The key word in the last statement is **community**. The community, stakeholders, or customers are the reason for our existence. It is for them that our fiscal policies are written. FSFM clearly states our level of accountability in the following, “All of the planning, documentation, and analysis is an attempt to provide levels of accountability which will satisfy stakeholders’ expectations.” (NFA ,1996, p. SM 4-5). Expectations are formed for the performance of the government, or specific individual customer expectations (or needs). This research will assess the needs of stakeholders in regard to the response map problem. FSFM discussed the government performance expectations and the following is a good description of what our stakeholders expect of us. “For every community the expectations are nearly the same. Stakeholders are looking for cost controls that minimize expenses to those paying for public service while providing a broad range of programs and services.” (NFA, 1996, p. SM 4-5). Throughout much of the organizational literature on financial management there appeared the theme of accountability to the stakeholder.

Montgomery County’s FY97 budget manual indicates that the county will use a program type budget for delivering public services. “Program budgeting is a display illustrating resource requirements and allocations for specific activities supporting the mission or goal of each department.” (Montgomery County, 1996, p. 5-1). What frequently occurs is there is an abundance of programs, problems, mandates and ongoing expenditures which must be funded with limited funding resources. Therefore the

organization must make the most of its resources and establish priorities of its identified needs. There are many ways that an organization can make the most of its limited resources. Tools such as establishing specific missions, strategic planning, analytic techniques, downsizing and outsourcing for services are just some of these procedures for managing resources. The remainder of this section on organizational processes will focus on strategic planning and some of the sub tasks, such as missions and needs analysis.

Montgomery County uses the term master plan to describe their strategic plan. In NAPA's *Developing Performance Measures for Montgomery County, Maryland Information Technology Projects*, they established that strategic planning is the core of successful projects. "Strategic planning is the process that steers organizational change by framing choices related to mission, identifying future opportunities and shortfalls, and involving uncontrollable environmental factors." (NAPA, 1995, p. 7). A simple yet powerful statement appeared in Bierman's, *Strategic Financial Planning*, which underscores the importance and everyday relevance of strategy, " 'Programmed activity tends to drive out non programmed activity.' " This was quoted by Bierman from Herbert Simon's book, *The New Science of Management Decision*. Hickel (1993) speaks to the importance of strategic planning as follows, "Where there is no strategic plan, or if the plan does not set out clear objectives and goals for a given function, it is difficult to assess whether a requirement behind an activity is valid. In those situations, you need to make assumptions, regarding the validity of a requirement" (p. 41). Validity of a requirement links to the accountability spoken of in the fiscal policy references. In the case of response maps

common sense dictates that it is a tool which will help the delivery of fire service in the sense that it is a just in time reference required for nearly every incident responded to.

Mission is also an important function of financial management, possibly as a sub-set, or, as the working tactical tool for achieving strategic planning goals. "The mission statement is the foundation of the strategic plan. It tells what activities the organization will carry out, why, for whom, and when." (NAPA, 1995, p. 7). Mission statements should help keep an organization on track. When questions arise in analysis of a proposed program the mission should be reviewed to see if the proposed program fits in. "The mission statement, when fully developed, is important for what it does not say as well as for what it says." (Hickel, 1993, p. 128). The point being, the absence of an activity from a mission speaks volumes about where it might fit either into the organization's present or future plans or its priorities. However, there should be flexibility enough to adjust if something new comes along that is mandated or which is appealing enough to be valuable to your stakeholders. For this reason, the organizational processes must provide for frequent, if not constant, evaluation and adjustment. Andrew Grove's book, *Only the paranoid survive*, discusses the importance of keeping an eye on virtually everything at once, taking no development in your field for granted. Businesses have been lost because they did not take a change in their field serious. One area which offers this level of shift can be seen in the contracting by municipalities of emergency medical services which may have formerly been provided by the fire department.

Fire response maps had been created within MCFR for many years and were not a

formal program. However, recent events, as mentioned in the background section, raised the maps to a higher level of priority within the organization. Yet they still are not at the level where it is considered a program, nor are they part of any other program. Therefore, there is no funding, which is the objective of completing the research for this paper, to document facts which will help in arguing for the needed funding and support for a mapping program. Analysis is an important function of planning. It is necessary to analyze a problem to determine the facts before decisions can be made.

NAPA identified a six phase strategic planning cycle to be used when considering proposed programs. This research will only be concerned with the first phase of the cycle - analysis of the situation. The paper NAPA wrote for Montgomery County on the development of performance measures provides the following as a first phase in a strategic planning cycle.

Analyze the situation. The team uses available data to look at where the program is or potential clients are in terms of the mission. To do this analysis, or environmental scan, the team gathers facts and analyze trends to help them understand the program context and where the program stands relative to stakeholder requirements. These requirements are related to factors such as customers' demand for services, the organization's core competencies, ability to adapt to change, and resources. (NAPA, 1995, p. 7)

This statement on analysis embodies the objective of this research, the determination of the customers' demand for services. In the case of Montgomery County's mapping needs,

the customers ultimately are the citizens who rely on quick reliable emergency response, however the primary customer in the case of the mapping, are the company level members, who will be using the maps, and the members who will be developing the maps, the internal customers. As Hickel (1993) stated succinctly, "If you're not serving the customer, you'd better be serving someone who is" (p. 36). There will be much more analysis needed before a full program proposal on mapping can be presented, but the development of the mapping needs are a major portion of the preliminary work.

In the general sense, this author read from many organizational books in looking for guidance on analysis, the two manuals specific to Montgomery County, as well as guidelines provided by the Office of Management and Budget for *Presenting Information Technology Requests*, were helpful information (and ultimately serves as the "Programmed Activity" for achieving programs in Montgomery County).

Mapping and Geographic Information

Literature searches for specific information on the management of a response map program for the fire and rescue service turned up very little. In fact, there was little mention of response maps and geographic information in the references for Fire and Rescue service management. This is an area where future research and writings are needed. This author was able to locate two relevant EFOP applied research projects (ARP) on the subject. One of the ARPs was developed specifically with pre-planning in mind and

focused on the influence of GIS on pre-planning. It provided good background information but was not relevant to this research. A periodical article discussed street indexes for response maps; another related to computer aided mapping for planning, was good background information only. The second ARP discovered was helpful. It provided information on developing a fire response maps system. There were numerous articles on file which addressed the mapping needs of dispatch and emergency call-taking centers, but these were irrelevant to this research. The field of emergency and disaster management offered query hits for many articles and books on mapping, however they too were irrelevant for this research. As mentioned previously, a paper was found on the internet, on a GIS vendor's home page, which proved to be very useful for this research. The paper contained a description about the response map system for the City of Glendale, California, by the vendor, *Environmental Systems Research Institute, (ESRI)* of Redland California. The paper provided many details that were relevant to our needs. For further study, the author plans on contacting both the City of Glendale and ESRI, Inc..

One important issue with the real time use of response map books is the requirement for ease of use. Many features affect ease of use. Response times can be negatively affected if it is necessary to find an emergency's location in the response map book prior to leaving the station. The ability to find the location can be hampered if design or formatting of the book is poor. In the article *A Quicker Compass*, Capt. Christopher Howes (1995) emphasizes the importance of the map book in the following, "A new addition to our map index is helping us accomplish the mission [saving lives and property]

by reducing the time it takes to look up an address, which, in turn, has resulted in a significant reduction of our overall response time” (p. 82). Howes also indicated that , “Of all the tools used in the fire service, an accurate map book of a station’s response zone is one of the most important” (p. 82). The information in Howes’ article focused on the improvement of the response map book index, which is also a problem identified in Montgomery County. This brings to light that the response book is more than just the maps. It is a consolidation of many items forming a system and they include: the binder, how the pages are held in the binder, the type and color of paper, text based information and ease of reading, page protectors, size and format of the maps, etc.. Further research will be needed in these areas.

One concern of fire officers in Montgomery County is the lack of standard maps. As indicated previously, it is necessary to move personnel around the county to fill daily vacancies. In this regard members are faced with many variations of response maps. This was a concern cited in Chief Holmerud’s (1992) ARP titled, *The Implementation of a Computer Based Mapping System for the City of Solana Beach*. Their problem arises out of the automatic aid shared among a number of localities in San Diego County, California. Chief Holmerud commented, “A common mapping system is a definite fire department operations tool” (p. 4). Holmerud’s ARP closely resembled the ESRI approach in Glendale. This author will contact the city of Solana Beach, Ca. for additional information. It is not known if Holmerud’s paper influenced the City of Glendale in their development of a fire map specification.

PROCEDURES

Setting

The study was conducted in Montgomery County, Maryland, a county of approximately 850,000 people and northwest of Washington D.C.. The county has been steadily growing since the end of WW II. Growth is projected to occur throughout the next ten years. The county uses a combination fire and rescue service, with career fire fighters as the predominate staffing for the service.

Research Procedures

This research employed three different procedures for gathering data, including: surveys, personal interviews and a focus group. There were two surveys administered one year apart. One to capture the comments and needs of the local fire department and one to capture more defined needs at the operational level of DFRS. Between the two surveys a focus group meeting was conducted with a cross section of the personnel who draw maps and otherwise provide geographic response information. Personal interviews were conducted with various employees of the county government to answer technical questions and provide other insight according to their area of expertise.

Survey Sample

Two surveys were employed to gather data on response mapping needs. The first

survey was conducted in March of 1997 and was administered to each of the 19 fire and rescue chiefs of the local fire departments. This survey really opened the window and provided initial direction for the research in this paper. The second survey was given to each of the 32 DFRS station commanders. It should be noted that while Montgomery County has 33 fire and rescue stations, one of the stations is all volunteer except for two DFRS members who staff an ALS unit Monday through Friday from 6:00 A.M. to 6: P.M.. This station's mapping comments were captured in survey one and no follow-up was needed. The second survey and the focus group results provided the core data for this survey. This author determined that random sampling was not necessary.

Surveys

Survey #1. Survey number one was conducted in March of 1997 to provide an initial body of information to the Data Subcommittee of the Priority Issues Study Group. The survey asked 25 questions about record keeping, maps, use of GIS/GPS, fire inspection records, map drawing, members involved with data work, use of technology, condition of records, etc.. Some of the questions were open ended, to obtain thoughts and comments, but most provide a specific choice for the respondent to choose. Survey one was sent to each fire and rescue chief of the 19 independent local fire and rescue departments. Survey one served to initiate the information gathering efforts regarding maps. Survey one was not considered in the analysis of the mapping needs. The information obtained began the chain of events leading to a formal analysis of how mapping was being accomplished and how it could be improved. Up to that point little interest was shown in the process of

mapping in the county fire and rescue service. Survey one provided enough information to satisfy the requirements of the data committee's report, but did not give a complete indication of where the county should go from that point.

Survey #2. Survey two consisted of 48 questions and was developed most specifically to assess the map maker and station officer's needs in regard to response maps. This author made the decision that the data from survey two could serve as a basis for the ultimate document communicating the response mapping needs for the county's fire and rescue services. Furthermore, survey two was developed with the goal of obtaining information from members who were actively responding to incidents on the various fire and rescue apparatus, and thus was sent to each of the 32 DFRS station commanders. This is based on the assumption that the career officers surveyed would have the same mapping needs as a volunteer responder. In addition, this author felt he had more control over the survey process if kept within his organization. A draft document of needs developed as a result of this research would be distributed to all members, career and volunteer, to receive additional input, correct inaccuracies, and to establish priorities among the needs. Additionally, survey two was designed to refine data obtained from survey one, answer questions which came up in the focus group and begin to form an idea of where we should head.

Focus Group

The focus group was formed of a cross section of personnel performing map drawing work. All of these members were active operational fire and rescue employees of DFRS. There were five members assembled for this meeting, including 2 - lieutenants, 2 - master fire fighters and 1 - fire fighter III. The group met for approximately three hours discussing a range of issues, including:

- Requirements for a response map book,
- Interim and contingency maps,
- Can the county's GIS Division meet our mapping needs? (We had a prototype of a map they proposed).
- What do we need in regard to maps right now, tomorrow and 5 years out?

The output of the focus group meeting helped to more clearly identify issues which needed further study. The output specifically served as the means for developing survey two. The output of the focus group meeting can be found in Appendix F.

Analysis of Data

The Survey netted a return of 27 out of 32, or 84%. The data were compiled and entered into a Micro Soft Access data base, Micro Soft Spread Sheets and Micro Soft Word for analysis. The data resulting in yes/no, or multiple choice type answers were

entered into the data base, sorted for improved review, then printed in tabular form. Each question formed its own separate data base file, since the questions were independent. The answers requiring textual comments were transcribed from the survey to a word processing document, where it was arranged in bullet form. This would allow for transfer to most any format later. The comments can be reviewed in full in Appendix D. The comments on specific needs were placed in spread sheet form as suggested by Juran (1992) in *Planning for Quality*. Juran provides that, "To simplify life for the planner, and make sure that nothing is missed, the needs are arrayed in some orderly fashion" (p. 40). "The spreadsheet is the chief mechanism for such orderly arrangement" (p. 59). Not part of this research is the next step in the overall planning process, and that is to list the secondary and tertiary subsets of the basic needs. This process is a recommendation in Juran and should help to bring detail and complete understanding to this early planning task.

For the focus group this author served as facilitator and recorded the results of brainstorming and round table discussions on a flip chart. The recorded information was then transcribed to a word processing document for further review. After formatting in this manner the data were analyzed to determine what it meant and if any patterns emerged.

Limitations

The survey and focus group had several limitations. In the survey it was assumed that all respondents would provide their true feelings about the questions asked.

Furthermore, it was assumed that the respondents understood the questions. Neither of

these assumptions could be confirmed. In addition, there were some survey questions which were not answered. Lack of an answer could have been the result of a number of reasons, including: did not understand the question, accidentally skipped over a question, did not like the answer choices, etc.. In any case, the number of unanswered questions were minimal and did not have a negative affect on the data.

The survey should have been piloted prior to administration. This possibly could have eliminated some of the missed questions noted above, as well as to improve the author's confidence in the data. Survey two, in some places seemed to have the text blend together making it difficult to read. This is partly due to the use of a landscape printing format and trying to fit too much on a page. This could have been improved through use of more white space, or printed lines between each question.

The focus group was not planned following any specific guidelines. While the cross section of members, represented a consistent representation of those doing maps in the field, the members chosen to attend was more a factor of who was available on the day planned. Further, the group discussion loosely resembled a focus group, as you might see in formal research settings. However, the use of a small, knowledgeable group, engaging in the brain storming process and exchanging ideas was very effective in the return on information. This author feels there was positive benefits obtained from all the methods used despite their acknowledged limitations.

RESULTS

This study analyzed the survey responses of 27 fire and rescue members and focus group transcriptions of 5 fire and rescue members of Montgomery County Department of Fire and Rescue Services. The analysis and interpretation of data reviewed the following areas: 1) fire and rescue response map needs, 2) problems mapping personnel experience in producing maps, 3) identification of who performs map development and maintenance, 4) affect of response maps on the fire and rescue mission and life safety, 5) Montgomery County's present capability for using computers to create maps. Survey items were grouped for the results section for their relevance to the research questions stated above.

Fire And Rescue Response Map Needs

In providing the results for this research question, the data is provided not as a quantified term but as a list based on written comments by the survey respondents and focus group members. The quantified survey questions provided support to the written comments and allowed analysis of trends between stations.

Needs specific to real time map use

When the question was asked "What would you say is the most urgent goal we should strive for in maps for our apparatus?" 20 out of 27 of the respondents on survey two indicated that map standardization was the most urgent goal. In addition to a standard format the respondents frequently ask for the ease of reading the maps.

The real time needs of the members using maps provided information to develop 19 specific needs. Among these needs were the interest in showing hydrants and all other water supply sources, symbols for common items such as fire department connections and knox boxes, colors for creating links between groups of buildings and the road they are addressed to, etc. The specific list of needs can be reviewed in Appendix E. One area of discussion came from the focus group and addressed the area of the index. No survey respondents indicated a need to address the map indexes. The survey data supported all of the map book needs identified by the focus group and went further by indicating additional needs. The output from the focus group can be found as Appendix F.

Survey questions 6 through 13 asked for specific quantities of map pages, to 1) understand approximately how many maps total were in apparatus, and 2) to try to quantify a cost for materials. Responses to these questions indicate that it was a poorly written question and the information was deemed unusable. There were some stations who did not answer the question, some of the answers appeared low and some answers appeared too high. Analysis of responses to question 25 which inquired as to the value of one general county map book, indicated that twenty two respondents (81%) agree and four (15%) disagree, while one (4%) did not know. Seventeen (63%) respondents to question 30 were aware of exemplary maps and provided written comments; ten respondents (37%) indicated that they were not aware. Question 34 inquired to the problem of lost pages from the maps books, five (19%) of respondents indicated that this was a frequent problem while nine (33%) indicated infrequent and 13 (48%) indicated that it was not a problem. If map pages were discovered missing during response a majority of the respondents

twenty-six (96%) answered that they would use the commercial, Alexandria Drafting Company (ADC) map book on the apparatus. One (4%) of the respondents to question 35 indicated that they would use another map but did not indicate which. Question 36 asked, “How fast should a piece of information be located?” The responses to this question all fell into the range of 10 seconds to 30 seconds, with fourteen (52%) answering 20 seconds, eleven (41%) answering 10 seconds and two (7%) answering 30 seconds. Question 37 inquired as to how we would handle detailed drawings of complex structure arrangements such as apartments, townhouses, etc., if we only used a commercial map set up for our use by Thomas or ADC map vendors. In response twenty-three (85%) indicated that a separate book should be used, while three (11%) indicated that pages could be inserted. One (4%) respondent did not answer.

Problems mapping personnel experience in producing maps

As was provided in the results to research question one there were a number of specific written comments addressing the needs of the members who create and maintain the response maps. In this section the results are textual in format and only an overview is provided. The actual needs statements are provided in Appendix E. The survey and focus groups indicated that there are a number of essential items needed to improve the creation of response maps, including: appropriately specified desktop computers and adjunct equipment, software such as computer aided drawing, GIS, data base, spread sheets and word processing applications, training to improve the knowledge and skills of the map makers, designated and secure work area, sustained time to work on the maps, etc.. Of these needs, time to perform the work, was indicated to be the highest priority. Responses

to survey questions which are quantifiable and support the written needs comments are provided in the text which follows.

Question 1 of the survey dealt with the estimated number of hours the map makers put into map work each week. Out of the 27 responses one (4%) indicated they put in more than 10 hours a week, while one other respondent (4%) indicated that they had no one to perform map work resulting in zero hours per week. The majority of the respondents, or twelve (44%) indicated that they spend 5 hours per week. Ten (37%) responded that they spend 1 to 3 hours per week and two (7%) spend 10 hours per week on map work. While the members who perform map work indicated that more time was needed, there was never an indication of how much was enough. This would need to be looked at in further study as it was an area missed in this research.

Question 2 deals with the time period during the shift when work on maps is most frequently accomplished. For this question the use of a 24 hour military type time keeping format is used. It is also the time keeping format used by MCFR and most fire and rescue systems. Fourteen (52%) of the respondents indicated that they perform map work in the 1900 to 2200 hour range, eight (30%) between 1300 to 1500 hours, three (11%) between 0700 and 1200 hours, one (4%) indicated that they had no one to work on maps and one (4%) works on maps at other times (comment indicates all different times). Question 3 asks if map work is assigned members as a collateral duty. Twenty-four (89%) indicate that map work is assigned as a collateral duty, while only three (11%) answered no.

Question 4 requests information on whether time is provided for members to

perform map work during other scheduled activities. The responses to this question were close to even, with sixteen (59%) answering yes and eleven (41%) answering no. Question 5 asks if time is adequate to achieving mapping goals, with twenty-two (81%) answering no, and five (19%) answering yes. Again it is not clear how much time would be needed to meet goals and there are really no performance goals established. This is another area where the research came up short from a design perspective. Question 32 asks how much time is spent each month performing maintenance tasks involving the map books. The largest number, nine (33%) spend 5 hours per month, seven (26%) spend 10 hours per month, and on the low side seven (26%) spend 1 hour per month. Four respondents (15%) spend 15 or more hours per month on map maintenance. Question 33 looks at the average amount of time it takes to complete a map from blank paper to ready copy. Answers to this question range pretty closely from 1 hour to 10 or more hours. The majority seven (26%) responded that it takes 5 hours, five (19%) take 4 hours, five (19%) take 10 hours, four (14%) take 2 hours, three (11%) take more than 10 hours, two (7%) take 1 or less hours and one (4%) take 3 hours to complete a map. This may be an area which could be expanded for more detailed study. What will improve the amount of time needed, training, GIS ready to use data, Better equipment?

Questions 29 and 31 deal with the efficiency gains of training. Question 29 asks if the members performing map work have ever received formal training in drawing maps, with twenty-seven (100%) answering no. Question 31 asks, if map training were provided would there be an improvement in the process of developing maps. Twenty-six (96%) responded yes and one (4%) responded no.

Who Performs Map Work

The respondents provided a list of all members who perform any work on the maps or geographic information for their stations. The list is provided as a table, with member's names excluded, and is located in Appendix G of this research. The table shows the rank of the member, the station, hourly pay rate and the role the member plays.

Affect Of Response Maps On The Fire And Rescue Mission And Life Safety

Analysis of questions 38, 39, 40, 27 and 28 provide a sense for how the respondents feel mapping fits into the organization's mission. In addition, two questions provide a look at whether stakeholders have expressed mapping as a service requested of the DFRS.

Question 38 asks if response maps have an affect on the safety and welfare of responders. Twenty-six (96%) of the respondents answered yes, while only one (4%) answered no. Question 39 asks if map information has an affect on the safety and welfare of the citizens. Twenty-seven (100%) answered yes. When asked if mapping is critical to the fire and rescue service mission, twenty-seven (100%) answered yes.

When questioned whether the local fire and rescue department expressed concern about the condition of the maps there was an even response to question 27 between yes and no. Thirteen (48%) respondents indicated yes and thirteen (48%) indicated no. One respondent (4%) did not respond. Question 28 asks if the local fire and rescue department asked the station commander or the senior career officer to provide maps for the station

twenty (74%) responded yes and seven respondents (26%) respondents responded no.

Present Capability For Using Computers To Create Maps

Analysis of questions 14 to 26 were directly related to the computer capabilities of the fire and rescue service in regard to producing maps. Question 14 asks if the members draw maps manually, and twenty-five (93%) of respondents indicated yes, two (7%) answered no. Question 15 asks if the members draw maps by computer, with nine (33%) respondents answering yes and eighteen (67%) answering no. Question 26 asks if mapping members are trained in the use of computerized map drawing programs. Six respondents (22%) indicate yes and twenty-one (78%) indicate no.

Question 16 inquires about which computer map drawing program is used. Seventeen (62%) indicated that the question was not applicable to them. Only one respondent (4%) indicated they used Autocad, while seven respondents (26%) said they use Visio, one respondent (4%) said they used Microstation and one respondent (4%) said they did not know what drawing program they were using.

Question 17 asks who owns the computers used for maps, with thirteen (48%) indicating that the question was not applicable to them, nine (33%) indicated that the local FD owned the computer and four (15%) indicated that DFRS owned the computer. One (4%) respondent indicated that the computer was purchased through funds supporting the Urban Search and Rescue (USAR) team.

Question 18 looks at how much money was spent in the last year on maps. Twelve respondents (44%) indicated that less than \$100 was spent, eight (30%) indicated that less than \$200 was spent, three (11%) indicated less than \$500 was spent and four (15%) indicated over \$500 was spent.

Table 1: Question 19 asks what type of processor does the mapping computer have.

	N/A	386	486	Pentium	Pentium II
Respondent	13	1	6	5	2
Percent	48%	4%	22%	19%	7%

Table 2: Question 20 The mapping computer has how many megs of RAM memory?

	N/A	4	8	16	32
Respondent	13	2	3	2	6
Percent	49%	7%	11%	7%	22%

One respondent (4%) did not respond.

Table 3: Question 20 asks what type of hard drive is contained in the mapping computer

	N/A	100 or less	500 or less	1 GIG	1.5 GIG	2 GIG or more
Respondent	13	1	2	4	2	3
Percent	49%	4%	7%	15%	7%	11%

Two respondents (7%) did not respond to the question.

Table 4: Questions 22 and 23 ask whether the mapping computer has either a zip or CD ROM drive.

	N/A	Yes	No
Zip Drive			
Respondent	13	8	6
Percent	48%	30%	22%
CD ROM			
Respondent	13	3	11
Percent	48%	11%	41%

Table 5: Question 24 asks what type of printer is used for mapping.

	N/A	Inkjet	Laser
Respondent	16	7	3
Percent	59%	26%	11%

One respondent (4%) did not answer the question

DISCUSSION

The results of this research indicate that an organization plan is needed to organize mapping efforts in the Montgomery County Fire and Rescue Services. Present activities toward this service are not as effective as they could be. Assessment of the needs should provide documentation and attention to the problem. This research was established with the goal of assessing and articulating the mapping needs for the fire and rescue services. This goal was achieved and with it came a tremendous amount of additional knowledge about mapping which would be helpful in implementing solutions to the identified needs. In the interim, results identified some key areas to focus on where changes in the business process could improve the productivity of the members completing map work. Further discussion in this section will describe the attributes discovered and provide answers to the research questions identified as the focus of this research.

Research question 1 assessed and then identified fire and rescue response map needs for Montgomery County. An overwhelming response to this question is the desire for

a map system which is standard throughout the county and which is easy to use and provides the highest level of readability. These articulated needs should serve as the basis for a new approach to maps which should be undertaken by the fire and rescue services. While there are a long list of specific needs, they all in some way, are subsets of the above. To accomplish such an endeavor the county fire and rescue service will need to build on the needs statement with a complete recommendation package designed either for turn-key implementation, or a longer term continuum of work, as is provided now, except with changes and improvements as indicated by this research.

One approach to improving the mapping system is to seek a turn-key solution. A turn-key solution would provide immediate benefit to fire and rescue personnel and would allow the personnel to focus only on the long term management and enhancement of the system. As noted from the literature review, of the projects pursued by the City of Glendale (ESRI, 1997) and Solana Beach, California (Holmerud, 1992), there are solutions available which, without the qualification of study, appear to meet Montgomery County's needs. The full evaluation of mapping should explore this alternative, as it may have advantages over a continued in-house process. A full list of the identified needs appear in Appendix E.

Research question 2 evaluated the kinds of problems mapping personnel experience in producing maps. The most frequent comments indicated by the respondents in answer to research question 2 is there is a general lack of time, equipment, software, training and overall support for mapping. This is not surprising since a comprehensive mapping program does not exist, nor has it been identified as a priority. The demand for

limited resources will dictate the need to identify this program as a priority. To this end, it will be necessary to promote the mapping program through a strong program plan, with this research providing the foundation. It will be critical to perform the necessary additional study to evaluate other alternatives before a final solution is decided on. As stated earlier long term cost effectiveness may dictate a turn-key solution instead of building the necessary resources and time into the organization.

In the interim it may be appropriate for Montgomery County to make improvements and early policy decisions to support the present process, as there may be a time gap before a final solution is approved and implemented. Since drawing is frequently an ongoing need to the operation of a fire and rescue organization it may be wise to spend some money now on computer aided design software, and training for the user so that some efficiencies are gained in the continuing development and maintenance of the present maps. In a personal communication with Karen Plucinski, of Montgomery County's Training Division of the Office of Human Resources, on May 12, 1998, she indicated that justification for training resources was often based on the documented needs of a stakeholder group through surveys or focus groups. She further indicated that the County did not have any documentation of data which supports the assertion that training increases the efficiency and productivity of a trained software user over one who has not received training, but she indicated that common sense would dictate this. It is not recommended that new equipment or software be purchased before at least an interim process is developed. This is to avoid unnecessary costs.

Research question 3 asked who performs map development and maintenance. In answer to this, you just about have to say that every station level rank is involved in the process. One positive finding of this research was of the strong tendency of the respondents to embrace the independent desire to make something happen on their own, with little or no resources. Without raising concerns the process was carried out informally for years. The list of members who perform work on the maps included everyone who had some role in the process. Anecdotally, this author has witnessed a whole shift of station members seated at the station dining table in an assembly line process, using colored pencils to color in areas on the maps which needed highlighting for easier reading. This is no surprise in the fire and rescue services, since the individuals will usually do whatever is needed to get the job done, but it is an example of who is involved in the process. In some stations only one or a few persons handle these tasks. The 27 survey respondents listed 64 members who have some role in map management county wide. One argument for continuing the present process of creating and maintaining maps is that, 1) it does not show up as a program expenditure in the budget, 2) the job is getting done, and 3) it is a cost effective and productive use of the member's time. Although I would argue against the accuracy of number 2 and 3, it can be anticipated as an opposing argument which must be considered when a program proposal is presented.

Research question 4 inquired if response maps affect the fire and rescue mission and life safety. Research results indicate that the answer to this is yes. However, due to this program never being formalized it has never received the support it would need.

Because of the way the county law is written for the organization of fire and rescue services, the DFRS has no formal responsibility for providing a program to address the needs of field mapping use. Montgomery County law provides that the state chartered local fire and rescue departments are responsible for all operations related services. Therefore, management of DFRS felt it was not a program that it had responsibility nor authority to pursue. On the other hand the local fire and rescue departments have always depended upon career fire and rescue members to complete this function, as they had no way of providing this function on a sustained basis. In this lies the reason why there is no central approach to the problem. Only through events identified in the background section, was there a move to take positive steps toward solving the problem.

As identified previously, DFRS does not have a legal responsibility to provide mapping, which is an operations based issue. However, the county laws do indicate that DFRS will provide various support functions to assist the local fire and rescue departments as needed. These services presently occur in a number of areas, including: management of all self contained breathing apparatus, facilities, training, etc.. The DFRS is the most likely organization to provide the mapping program, as the majority of staff and expertise in completing map work is presently assigned to them. In addition, DFRS has the following specific goal and strategy within its organizational description, "As a significant member of the County's fire, rescue and emergency medical services delivery system, it is the fundamental goal of The Department Of Fire And Rescue Services to make an on-going positive contribution towards the provision of public safety services in Montgomery County." (DFRS, 1996, p.2). More specifically the department lists the following goal and

strategy, "To support the timely response of requested fire, rescue and emergency medical services personnel and equipment for the purpose of the aggressive mitigation of incidents; ... [and] Maintain a system of administrative and operational support for the field operations and programs of the department." (DFRS, 1996, p. 2). As unanimously indicated by the respondents, mapping affects the safety of the citizens and fire and rescue members, (question 38 and 39), and is critical to the mission of the fire and rescue service (question 40). Furthermore, the local fire and rescue departments have both asked for our personnel to provide mapping, and are concerned about the present condition of the maps (questions 27 and 28). To this end it would appear appropriate for the DFRS to provide the mapping work as an organized program.

Research question 5 evaluated the present capability for using computers to create maps and what range of equipment is available to the personnel who prepare maps. As indicated by the results for this research question there is more manual, pen to paper, map drawing than maps created by computer. There are a number of reasons for this, 1) Thirteen (48%) of the respondents did not have computers capable of mapping, 2) Of those that had computers only nine out of thirteen had access to computer aided drawing, 3) even with a nearly 50% split of those having or not having computers twenty-five (93%) of the respondents indicated they draw maps manually. An observation about these points can be made and this would be that drawing on the computer can be nearly as tedious as drawing by hand. The most likely way to provide a leap in efficiency and productivity is to provide training and GIS data. This author learned during this research that every bit of the needed GIS data is available now, for no additional cost. This data can be formatted by the

GIS division into file formats which will work with the present CAD or GIS software.

However, to deal with this data it will be necessary to provide the map makers with training.

In regard to the use of GIS one might wonder why we do not enlist the assistance of the GIS division to make our maps. The fire and rescue service made this request, however the GIS division was not able to meet our large needs due to a lack of staff resources themselves. The GIS division, in their master plan provides the following, "Current Department of Information Systems and Telecommunications GIS staffing levels are insufficient to provide the level of application development and end user support that is necessary to expand the GIS in a significant manner." (Plangraphics, 1996, p.2-3). GIS has committed to providing the data which will enable their customers to still receive nearly full benefit of the GIS data. Some of the DFRS mapping members are now exploring the efficiency that could be gained through the use of GIS data in conjunction with CAD.

The area of computer capability is important to the documentation of mapping needs, as it appears that future mapping capabilities are directly linked to the use of computers. Furthermore, any continued development of maps should be moved to the digital environment since the county's near future migration to mobile computing will have as a major component, digital mapping. While the proposed mobile computing system will have a resident GIS base system, it will be enhanced by detailed drawings of complexes such as apartments, industrial campuses, etc., which we would need to provide. Any drawings produced with mainstream CAD applications would be capable of migrating the data image to new mobile computing system. The scanning in of the present manually

drawn maps as bitmap images, would not be acceptable since images do not always transpose in a quality manner. The saying goes “garbage in-garbage out.”

As has been commented on previously, any direction in the way of improving or changing the present process should not be accomplished until a strategic plan is approved.

RECOMMENDATIONS

This research serves as the source for the following recommendations:

1. Immediately perform research to find other metro size fire and rescue departments who have successfully implemented a GIS based response map system similar to the Cities of Glendale and Solana Beach, California. Where possible obtain copies of request for proposals (RFP), strategic plans, or any other documents which describe system specifications and requirements.
2. Complete the necessary work to develop and propose a strategic plan which provides for a comprehensive response map system meeting the needs identified in this research. This plan should also include at minimum, the alternatives available, short and long term requirements, funding and resources anticipated, and evaluate the desirability for the procurement of a turn-key mapping system similar in scope to the

Cities of Glendale and Solana Beach, California.

3. Immediately develop written justification for funding support to the Department of Information Systems and Telecommunications - GIS Division for an additional one work year staff position as needed to support DFRS GIS needs.
4. Review the present business process of station management to determine the management effectiveness in light of the heavy call volume and increases in mandated activities. Indicate if only mission related activities are being completed and recommend where help can be provided to assist the stations with areas they are not having enough time to complete. Include in the study the need for improved technology, station physical plant changes and ultimately changes in policy.
5. Establish a plan for general automation management of all hardware and software applications used by the fire and rescue services in its business processes. This plan should address the basic needs of each work site; recommend a goal for the level of technological equipment supplied for use by the members; security of data, files, applications and equipment; recommendations for technical support; training for all personnel who have a need to use the equipment, hierarchy of work site priorities, necessary funding to achieve goals, life cycle costs, and policies for management and use of the equipment.
6. Perform the necessary study into alternatives for training personnel in the use of computers and applications. This study should explore the costs for training, the

feasibility and funding needed for a computer training lab, on-line training, use of interactive CD ROM for training, etc.

7. Study how the department can reduce the practice of transient staffing which increases the risk of members being less familiar with the area they are working at and frequently takes the members who presently perform map work away from their stations.

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APPENDIX A – Survey Transmittal Memo**M E M O R A N D U M**

March 31, 1998

TO: William Ale, Captain Station 1
FROM: Mike Love, A/C
SUBJECT: Mapping Survey # 2

One year ago I initiated a survey on behalf of the Data Sub-Committee of the Priority Issues Work Group. The survey was designed to capture data concerning how we format geographic information for use in response to incidents. Since that time we have compiled and analyzed the data collected, and are using it as a springboard for a standard approach to providing geographic information. We have tentatively received the commitment of the FRC to purchase four mapping stations to assist in producing maps in the field. Further, all of the local fire and rescue departments responding to the survey, indicated that they were in favor of standardized mapping.

As front line officers in the operations area, I come to you now to expand on some of the information we collected earlier. While I appreciate that you are all busy, I think this next phase of information gathering will give us a substantial base of argument for our goal, which is to provide accurate and consistent and timely geographic information in support of our most mission critical activities. I ask that you be completely objective in your approach to the survey and provide us with the true picture of how we are collecting and formatting geographic information. Where the survey asks for specific information about the hardware used, be as specific as possible and provide as much information as possible.

Please return the survey to me at Station 20 by April 15, 1998. If you find you cannot return the survey by April 15, please just send it as soon as possible, or return it blank. I have included as an enclosure, the results of the 1997 survey, and a paper used to brief the County Council on Geographic Information as it relates to our future Mobile Computing project. I hope you find the information informative. If you have any comments I would like to hear them. Thank you for any help you can provide.

APPENDIX B - Research Survey

Fire and Rescue Mapping Survey April 1998

Completed by: _____ For Station _____

Circle approximate number of hours personnel put into map work each 1 week. Estimate low if you cannot determine. (Circle one)

OTHER

10

5

1900-2200

OTHER

Indicate the time period of the day when work on maps is most frequently 2 accomplished. (Circle one)

0700-1200

1300-1500

1900-2200

OTHER

Are the mapping duties assigned to personnel as a collateral duty? 3 (Circle one)

NO

YES

Is time provided for the mappers during regular scheduled activity periods? 4 (Circle one)

NO

YES

Is the time provided the mappers adequate to complete the goals. (Circle 5 one)

NO

YES

How many pages of first due maps do you have in your map book? 6 (Enter the appropriate number)

How many pages of second due maps do you have in your map book? 7 (Enter the appropriate number)

How many pages of third due maps do you have in your map book? 8 (Enter the appropriate number)

How many pages of fourth due maps do you have in your map book? 9 (Enter the appropriate number)

How many pages of fifth due maps do you have in your map book? 10 (Enter the appropriate number)

How many pages of miscellaneous maps do you have in your map book? 11 (Enter the appropriate number)

How many pages of running route directions do you have in your map, or 12 information book? (Enter the appropriate number)

13 Your running route book includes only? (circle all that apply)

1st due

2nd due

3rd due

4th due

14 Do your mappers draw maps manually? (Circle one)

YES

NO

15 Do your mappers draw maps by computer? (Circle one)

YES

NO

APPENDIX B - Research Survey

Fire and Rescue Mapping Survey April 1998

If you use a computer which of the following drawing programs do you use? (Circle one)	AUTO CAD	VISIO	ARC VIEW	MAP INFO	Don't Know	Other (list in comments)
	LOCAL FD	MCFR				
16	< \$100	< \$200	< \$500	> \$500		
17 Who owns the computer you use for maps? (Circle one)	386	486	PENTIUM	PENTIUM II		
18 Try to describe how much money has been spent on maps in the last year? (Circle one)	4	8	16	32	64	
19 The mapping computer has what type of processor? (Circle one)	100 or less	200 or less	500 or less	gig	1.5 gig	2 or more gig
20 The mapping computer has how many megs of RAM? (Circle one)	YES	NO				
21 The mapping computer has a hard drive with _____ megs of memory. (Circle one)	YES	NO				
22 The mapping computer has a CD-ROM drive. (Circle one)	YES	NO				
23 The mapping computer has a ZIP drive. (Circle one)	INK JET	LASER	PLOTTER			
24 The mapping computer uses what type of printer? (Circle one)	YES	NO				
25 In your opinion, is there value in having one county map book showing general info, hydrants, hundred blocks, etc. for all apparatus? (Circle one)	YES	NO				
26 Are your mappers trained in the use of computerized map drawing programs? (Circle one)	YES	NO				
27 Has the local fire and rescue department expressed concern about the condition of the maps? (Circle one)	YES	NO				
28 Has local fire and rescue department asked you or the SCO to provide the maps for the station? (Circle one)	YES	NO				
29 Have your map makers ever received formal training in drawing maps? (Circle one)	YES	NO				
30 Can you identify any stations who are producing exemplary maps? (Circle one) IF YES, WHICH STATIONS (include in comments)	YES	NO				
31 In your opinion, will there be an improvement in the process of producing maps, if we provide training to our map makers? (Circle one)	YES	NO				

APPENDIX B - Research Survey

Fire and Rescue Mapping Survey April 1998

How much time in hours (approximate) is spent each month maintaining
32 the map books on the apparatus? (Circle one)

What is the average amount of time (in hours) it takes for your map
drawers to produce one map from blank paper to ready copy? (Circle
33 one)

How often do pages become lost from the map books? (Circle
34 one)

If a map page is missing and is not discovered until the apparatus is
35 responding, what is your contingency for finding information? (Circle one)

How fast (in seconds) should a piece of information be able to be located
36 from the time the book is opened? (Circle one)

If we used a map such as ADC how would we deal with visuals of
37 complexes? (Circle one)

Does map information affect the safety and welfare of responders? (Circle
38 one)

Does map information affect the safety and welfare of the citizens? (Circle
39 one)

In your opinion, is mapping critical to the fire/rescue service mission?
40 (Circle one)

	5	10	15	20	
1 or less	2	3	4	5	10
Frequent	Infrequent	Not a problem			
ADC	Other Maps	No contingency			
1	5	10	20	30	45
Separate book	Insert pages in the ADC				
YES	NO				
YES	NO				
YES	NO				

APPENDIX C - OVERVIEW OF RESPONSES TO SURVEY 1

M E M O R A N D U M

June 5, 1997

TO: Steve Kurtz, Task Group Leader

FROM: Mike Love, Group Member *WML*

SUBJECT: Geographic Data Survey Overview

The following are some observations resulting from the survey we conducted on Geographic Data.

- Only two respondents out of sixteen indicated using GIS information for the development or maintenance of their response information. GIS is a grossly underused resource and we need to pursue GIS information which has already been secured and formatted by the County instead of wasting time and resources creating the information ourselves, nineteen times.
- All respondents indicate that a standard approach to mapping is appropriate. However, there is hesitation to move to a system which would be less than what some local fire and rescue departments are presently using.
- All respondents indicated an interest in a geographic data users group for creating a common mapping approach, as well to allow their thoughts and experience to be shared by others. However, many of the map makers are bargaining unit employees and would need appropriate compensation.
- All respondents indicated that they were using text based running routes developed and maintained within the local fire/rescue station. These are formatted in data bases and word processing and used in various forms.
- All respondents indicated that they maintained a binder to store running routes on the apparatus.
- Very few depend upon the left- right directions available from Dispatch. We need to do additional research to determine how this resource can be improved for more frequent use.
- The majority of existing maps were hand drawn. Some places are now exploring ways to use computers to maintain or draw news maps, often using Computer Aided Design applications and commercially available digitized maps as the beginning point.

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June 5, 1997
Page 2

- There is little use of data base for storing vital response information and only a few indicated using a user friendly and feature enabled data base such as MS - Access.
- The use of Computer Aided Design (CAD) applications is emerging in our system through the use of Auto Cad, Microstation and Visio. Seven respondents indicated they were using CAD to assist in geographic data. These applications are generally expensive and high powered, but less powerful applications are now coming on the market which could suit our needs. One area of concern with having so many different CAD programs is the expense, if we ultimately decide on one application and whether it will be possible to exchange files between them.
- Most of the respondents indicated the use of text based processing for some of their data management.
- Only one respondent indicated using spreadsheets for their response information.
- At this time, none of the respondents are using GPS in their development of response information. However, this is an area which is quickly emerging as a useful tool in creating accurate information. More evaluation is needed.
- There may be some value to developing our specific requirements in the form of a request for information (RFI), or request for proposal (RFP), to determine how a vendor might propose delivery and pricing of a package which would meet our needs. There are many companies in the business world providing the types of services we are looking for. Why should we struggle at it?
- The Data Workgroup feels it is a priority that the fire and rescue services have a full time person to coordinate technology. Police have a full time civilian manager, a sergeant and a captain who coordinate data and technology.

I know that we will be discussing these and other data issues soon, but wanted to begin to use some of the valuable data we collected. I will send another survey to those departments who did not respond.

APPENDIX D - Survey Respondent's Comments

1. *What do the mappers need that is not provided, be specific?*

- A computer for station (24)
- Computer (40) and appropriate software, scanner.
- Computer (R2), time, money - right now it is up to the local fire and rescue department.
- Time and fewer interruptions; training in computer applications, performing incentives.
- Training and identify the overall [mapping management] program
- Formal training, incentive for map work and hardware.
- Current technology and equipment. I am sure the technology exists to do everything necessary and then some. Stations need to be provided with PCs and programs that are in line with current technology and growth capabilities.
- A complete package to include computer hardware, software and training - also time to work on maps.
- Standardization - program that works, training, pay for extra duties, today's computers - not 286s and 386s.
- Map drawing materials: drafting table w/equipment, or computer program.
- Computer training to produce maps. Mechanical drawing equipment is currently sufficient.
- Computer programming and drawing capabilities with the goal of a standard county system.
- Better computer and laser jet printer.
- [Microsoft] Access data base set-up [license] for running route, so all are standard and fields are the same (Steve King's set-up). [software applications]
- More time!
- Time and materials, time is the most important part.
- Time! - a dedicated area to work - that can be secured and allow maps/papers to remain out, so you don't have to put everything away each day. If using computers, adequate hardware.
- Uniform mapping format

- Training
- CAD or mapping program and dedicated PC
- Designated, uninterrupted time [to perform work]
- Training, equipment, guidance and standards.
- Computer of adequate spec[ification], software (not provided by corp. [the local FD]), more time.
- Time - responding on incidents, activity periods [other activities], etc.. Very little time is spent on maps.
- All maps should have the same format, index and symbols, etc.
- Direct communication on new street proposals and new technology to improve production and quality [of maps].
- Better CAD system with color printer, and time!
- Designated work area, drafting table, lighted drawing board for tracing.
- Release from other duties and vehicle [assignment] to see area.
- Time, training
- Access to park and planning data base
- CAD or a computer based program to make mapping system better.
- Centralized data, shared information, on line directions, complex and site data including hydrants, FD connections, utilities, premise information
- More time to ride area checking on new street and buildings.
- Have all new street and building plans sent to local FD

2. If maps such as ADC, or Thomas Maps were provided with appropriate information for apparatus use, what items would need to be included? hundred block indications, index grids, hydrants, What else? List all envisioned requirements.

- Hundred block with splits, hydrants, static water sources, individual addresses in rural areas, special hazard notes and define haz mat occupancies.

- Hundred block indications, index grids and hydrants are a good start.
- Hundred blocks, hydrants, major buildings, just like old laRue maps.
- Schools, parks, the maps would need to be a larger scale to improve readability in responding apparatus.
- Hundred block indications, hydrant locations with [address] numbers, color coding of complex maps, i.e. same block same color.
- Major buildings
- Reference to complex map.
- Latitude and longitude marks for GPS.
- Special access information and complex maps.
- Knox box, automatic sprinkler and standpipe connections, utilities, BIO, 901 [classification].
- Landmarks on each map, all maps with North at top of map, station direction indicator.
- Water sources other than hydrants, target hazards, i.e. those having certain amounts of hazardous materials. Alternative access routes.
- Helicopter landing zones
- Special hazards, drafting tanks and [address] splits.
- Latitude and longitude coordinates to go along with GPS system.
- Splits [address] in middle of block, [show] islands [median strip] on major roads, to indicate where a turn can be made.
- Show bridges
- ADC is good for general use, a main problem is the “built in” mistakes, all of these would need to be removed.
- Distance markers, travel directions of different companies, enlargement symbols of more detailed maps, adjoining maps, connections of buildings (FD Connections), special symbols i.e. fences, dead ends, railroads, ponds, pre-planned split lay locations.
- Schools, churches and other target hazards, site maps, indications of one-way streets, distance indicators on site maps, hydrant distances, location of standpipes

- Hundred blocks, hydrants, larger scale, removal of streets that are not there [the pseudo streets placed in ADC maps], major buildings.
- Connections [FD], hazard notes.
- Fire control room location, knox box location, fire dept. connections, closest hydrant address.
- Rural water supply, knox box locations, remove ADC copyright streets. [Pseudo streets]
- Fire Department connections, haz mat info, name of building, special hazards, type of building construction, if space permitted and cross streets.
- North arrow to show which way you are coming from.
- Reference numbers for complexes.
- Color coding for hundred blocks
- Buildings and complexes [footprints], standpipe locations, access and restricted access to buildings.
- Building [footprints] location w/address, sprinkler/standpipe connections, typical floor plans.
- Colorized hundred blocks in complexes
- Bridges, hazards, area water supply resource, rail road crossing.

3. *What would you say is the most urgent goal we should strive for in maps for our apparatus?*

- Hundred blocks, hydrants.
- On time updates [timely revision]
- Streets, hundred blocks.
- One format, symbolism, being able to take advantage of the technology, as well as being able to input our own info to make the existing digital database even better.
- Identify a unified system, spend time identifying the way we will do business, then train everyone involved.
- Running routes.

- Wireless data access in apparatus and standard computerized program with equipment to support same in stations.
- Clear and easy to read - especially at night. A standardized system.
- Standard system. With our present system of detailing personnel, unit officers and drivers, [they] get confused with different [mapping] systems.
- Training on how to make a map, re-draw all maps to show major close landmarks or intersection, draw all maps top to bottom so that all turns are shown right or left as looking at the page.
- Clarity and consistency.
- Standardization.
- Better readability and standardization.
- County wide standard and ease of reference.
- Honestly, I really don't feel the urgency for better maps, other than all maps should be the same quality county wide.
- Consistency - all maps should be drawn so you enter map from the bottom of the page, so rights are right and lefts are lefts! Same formats i.e. the main map for a neighborhood, then break down into larger scale for more detail and house numbers.
- Uniform mapping format which would be easily used when detailed to other stations.
- Standardization of maps and using a grid system.
- Standardized maps.
- Easy to read, colors help identify symbols.
- Standardization
- Something that is easy to follow, read and is color coded.
- Think of the out of district officer.
- Consistency of running direction, detail officers do not know where on map to start if completely unfamiliar with area.
- Standardization
- One system used by all with accurate information.

- Make all map book standardized.
- Standardized format, ease of use, speed

4. *Do you have any ideas on how to solve the problem of lost map pages?*

- Have extras ready in the station.
- We do not lose them. They are in protective viewers. ADC books are poorly bound.
- Our experience has been that pages that are enclosed in medium weight plastic protectors and bypassing ring binders are less prone to loss.
- Also having a few quality personnel who are generally interested enough to take the initiative to replace what has fallen out during their tour.
- Improved page protectors (no tear!)
- Computers with backup running route book.
- Complete apparatus checks!!! At least during the weekly maintenance.
- Put computers in the apparatus! Eliminate it [lost maps] all together. Maybe heavy duty sheet protectors.
- Use non-tear paper.
- Plastic pages help.
- Once a month review of numbered maps.
- [Station] 23 rarely has a lost map problem
- High quality, heavy weight sheet protectors seems to lesson lost page frequency
- Get rid of binders [three ring type]
- Use catalog racks [mounted in cab]
- In almost all cases lost maps occur when 3 ring binders are used. Provide a mounting system in all apparatus!
- Maintain at least 2 master copies of maps in separate locations.
- Fit all apparatus with parts catalog racks and print [maps] on mylar.
- We use plastic inserts.

- Not a problem if they are in page protectors. Updates could be a problem if they are not entered into book.
- Number the pages
- Print on tear proof paper
- Use catalog rack, type holders. Loose leaf binders do not work well after a short time.
- Use top quality page protectors in mapbook, so pages don't tear out.
- Digitized reproduction
- Make it part of the monthly checkout or inventory.

5. ***What improvements would you suggest for the maps, running routes and map books?***

- Time to do the work.
- Again, a system so that all are consistent.
- Reference points on maps to show where you are coming into that area and where from.
- Must have map on page with some major [reference] streets!
- A small window on map, showing the general vicinity.
- Ease of read. Differing line weight of street layouts, buildings, print and details should be regulated with specific line thickness' and shading, for specific purposes, to help show definition.
- Color codes, updates from E.C.C. [communications] review of plans prior to construction.
- Provide stations with capability to produce color graphic enhanced maps.
- County wide standard, ease of reference, on board [apparatus] computer navigation system.
- I have seen maps in other areas with an excessive amount of addresses on one map. Suggest small geographical area per map.
- Use the same computer program [MS Access] for running routes, County wide.

- Standard methodology and terminology throughout the system.
- Reduce the number of maps.
- Standardizing with computer design. If county went to computerization, have committee to design program with what should be included. Members of committee should include all county.
- Use non-tear paper
- Use fastest and safest running routes.
- Consistency - adjoining map indicators, enter from the bottom of page on all maps, put 3 or more streets on a page.
- Use KDTs [mobile computer] for running routes, maps and pre-plan info, should come up on screen during response.
- Training, hardware and software.
- One index should refer you to all maps that are appropriate, etc.. Maps with all the streets of that area down to complex maps.
- Standardize the language [orientation] for lefts, rights.
- Make it an easy system, so someone can be trained on it fast.
- Survey the apparatus drivers, let's hear what they have to say about directions.
- A common key so building components can quickly be identified.
- Standard format, county wide digitized data
- Have street drill like we used. Make it part of the standardized training program.

6. ***How should we reward people who perform mapping work?***

- 5% of base pay, differential.
- raises! Allow the time and space to do a good job.
- Time, compensation and accountability.
- 5% pay raise, non-detail status.
- It should be part of the job, good support will have a big impact.

- Money or annual leave credit.
- Pay
- Overtime compensation on day off. Dedicated time [during daily activity schedule] – no disturbance.
- Form a mapping division under the direction of a district chief [records management??]. Hire interested personnel to perform mapping work on an overtime basis. Provide specialized drawing, drafting and CAD training at DFRS expense.
- Provide them with extensive training and high tech equipment to complete their task.
- Pay - as any other specialty Honor Gaurd, Haz Mat, SCBA, etc.
- Provide time and money (specialty like SCBA techs.)
- An extra percentage in pay (3%)
- Comp leave or specialty pay (like SCBA Tech or Paramedic, but it would be a map tech), perhaps by district (the district 4 map tech).
- Train and monetary.
- Some type of special assignment pay, awards with PPA, or mini awards program.
- [Pay] differential consistent with SCBA [technicians].
- More money!!
- Should be their only function.
- Hire out real map makers
- Pay them! Its at least as important a function as SCBA, haz mat, etc. until someone else does it for us.
- Just give time to do work right and keep up with new area.
- Pay! It is a lot of work of work making new maps and keeping the whole thing updated.

7. *Additional Comments about maps, or other reference materials used during response.*

- GIS mapping system may be able to provide basic map needs.
- Map by box area where possible. Can probably reduce size of box areas to facilitate

this.

- Very often buildings are up before we have a drawing, and info on it. Planning commission.
- Emergency Communications Center personnel should be involved in County-wide mapping project.
- The more detail the maps the better, but too many maps can be 1,000 pages. [Show] stairways, elevators, lakes, streams, ponds, cisterns, apartment numbers, electric, water, gas shutoffs, size water mains, size gas mains.
- Dispatching and maps should give the closest cross street for reference
- Keep fire personnel for many years at station so they will [become] intimately familiar with their area.
- Each station has their own set ways that works for them. Try not to disrupt it too much.
- Experiment with different GPS/GIS software in units. Coordinate with other county agencies to get the best maps with minimal effort to produce.

List all personnel who perform any work on your maps, or who even provide support or maintenance of the binders. Indicate their role, i.e., draws maps, types running routes, etc. (See Appendix G).

APPENDIX E - Response map needs

1. Address/Hundred block issues for all streets, labeling each hundred block, the split at intersections and address for each property in rural areas.
2. Fire hydrant locations with a label of the closest street address.
3. Location of all static water sources.
4. Index grids
5. Building footprint or outline. [Need to establish a specific criteria for what buildings are included].
6. Special hazards indicated for buildings. [Need to establish a specific criteria for what buildings are included].
7. Label indication and footprint for major buildings, including schools, churches, shopping, etc.. [Need to establish a specific criteria for what buildings are included].
8. Establish an easily readable scale, including font style and size. [Two of the papers reviewed indicated a scale of 1" = 400', also these references used 8 1/2X 14 binders].
9. Use of color printing for coding common objects such as hydrants, knox boxes, sprinkler and standpipe connections, etc. In addition color should be used to offset address range when a complex structure development is mapped such as garden apartments, town houses, etc.. The use of color for reader ease was an over whelming need identified. [Need to establish a specific criteria for how color will be used].
10. Place an identifier in the macro view of a map to link the spot to complexes or other areas which would require a closer more detailed view. These details may be in the form of a window on the side of the page, or another map page.
11. Labeling of longitude and latitude for use with GPS receivers and reference for helicopter landings, etc.. [GPS in the creation of maps is an area which will require more study].
12. Symbols to show location of various items of interest to the fire and rescue members, such as knox boxes, utility shutoffs, fire department connections, fences and gates, access, bridges, rail grade crossing, etc..
13. Standard direction orientation on every map. All maps should be formatted so that as you open the book north will always be at the top of the page. A compass rose will be conspicuous showing the north direction.
14. Indicate land marks on maps where possible. Such as place names, buildings, etc..
15. Indicate roadway differences by line thickness. Show median strips and median breaks

on divided highways. Provide details of freeway interchanges, as well as access to through lanes and collector and distributor lanes.

16. Use overlap and provide an indication of adjoining map areas. Reference to literature review papers indicated that a 5% overlap was appropriate. [This will require further study].
17. Provide prompts as needed for water supply considerations, such as, where a split lay is needed, distance between hydrants, etc..
18. Indicate when streets are one way, also provide a symbol for traffic calming (speed bumps) devices.
19. Each map should be provided with a major roadway which can be used as reference.
20. Improve the ergonomics of accessing geographic information in response vehicles, including light, storage, binder configuration, map size and scale, type of paper, etc.
21. Equipment for drawing maps, including: computers and CAD applications, graphic color plotter type printers drafting equipment and supplies, GPS interface to computers, etc.
22. More sustained time during the shift to meet mapping goals.
23. Technical training for improvements of skills in computers and applications used for map work.
24. Technical support for hardware and software.
25. Direct relationship with the GIS division for data access.
26. Appropriate security for data and equipment used to make maps. Where possible provide a designated room appropriate for this work.
27. Policy for management of the mapping system to include, security of data, guidelines for custody of up dates, goals on refreshing data, standards for formatting.
28. Reduce the amount of staffing details which put people into areas they are unfamiliar with thus putting more burden on the requirement of flawless response information.
29. If a response mapping system created by the fire and rescue members is the concept we will choose for the future, create a system which will reward personnel who develop the maps.

APPENDIX F - Mapping Focus Group Minutes

Mapping Meeting

Monday, February 23, 1998

Meeting started at 0800 hours

Attending: Lieut. Kenneth Peters (6A), MFF David Galt (29C), MFF Andrew Bowen (15B), Lieut. Jon Feidler (12B), F3 Randy Ohler (8C), A/C Mike Love, C Shift, Steve Kurtz, GWGFD.

Discussion of what we need right now in regard to maps:

1. Inter-agency cooperation and information sharing.
2. Identification of mapping as a mission critical - life safety activity.
3. Needs assessment should be undertaken to determine the minimum valid requirements.
4. Identify inputs, outputs, outcomes, visions, goals, objectives, etc.
5. Provide a central approach to developing maps and other geographic data.
 - Coordination
 - links and interfaces with other data bases - Records Management System
 - sources of all data
 - networking and electronic links
6. Standards and standardization
7. hardware and software (minimum equip., common format migration)
 - Access to data other agencies possess
8. Funding and resources
 - hardware and software
 - time to complete work
 - incentive pay for staff performing mapping work
 - training and education
- networking - 1) w/other agencies, 2) w/in County, 3) w/other jurisdictions
- Conferences to raise awareness with our map makers, contacts, ideas
9. Priority of needs/ updates
10. Distribution and general administration and support
11. Improve information flow, identify how the information flows.
12. Text based data - directions, pre plan info, etc.

13. GIS/GPS/AVL - DOT and traffic lights? Yes, this can be done. Real time directions.
14. Need to determine and develop needed editing, maintenance, coordination and administration requirements.

Planning Questions -

What needs to be done now? See above.

What do we need tomorrow? TBD

What do we need in 5 years? TBD

Review and discussion of the DIST-GIS prototype map. With discussion what it needs, is it appropriate, do we want this type of product.

Compared the DIST map with Station 6 maps developed by Lieut. Peters. All were in concurrence that the Sta. 6 maps were in a desirable format and should be a preliminary model for future maps.

DIST - GIS can produce maps for us, but will only develop one prototype.

Steve Kurtz and Mike Love will meet with GIS Division on Wednesday, 2/25 to discuss future GIS services for MCFR. We will also be seeking common symbols available, as well as the various layers presently in use in the County's GIS system.

Discussion of requirements for a map book -

1. Need consistent maps everywhere, right now.
2. Maps should include the following characteristics or elements:
 - Compass Rose for orientation
 - Graphics of sufficient size to accommodate all visual ranges of the readers
 - Street names
 - Block Numbers (*need to further define where it is placed on the map, splits, etc.*)

- Easy to read
- Drawn to scale (***we need to identify an MCFR scale***)
- Building foot prints for all greater than 3,000 sq. ft. (Or define), also foot prints of special areas, such as campuses, mil and gov. Bases, industrial compounds, etc.
- Building information, ie: name, Fire Dept. Sprinkler and stand pipe connections, knox box locations, utilities, etc. (Is this on a general reference map or would it be on a special page for each building?)
- Grid references and connections to next map, adjacent maps, etc. (We should provide some specific examples of how we want this)

Hydrants (Do we want to indicate main sizes in some way?)

Colors and shading

Index - easy to read and relate to pages where the specific information is contained, see Thomas map index, but more specifically - lists streets, buildings, hundred block splits, townhouse complexes, apartment complexes, commercial developments, government, medical, institutional industrial and educational campuses.

INTERIM - Thomas Map Directory.

- Water Supply maps for limited access highways, Rt 495, Rt 270, etc.
- Sound barrier connections and access to water supply
- Mapping Symbols - What shall we use as standard symbols?
- Hydrography
- Who will update maps?

Appendix G - Personnel performing map work

Rank	Station	Hrly Rate	Role	Rank	Station	Hrly Rate	Role
Ca	20	\$24.57		FF	12	\$16.23	
Ca	2	\$24.57	All	FF3	14	\$16.23	Draws, diagrams, types running routes
Ca	4	\$24.57	Coordination and Liaison w/ the local FD	FF3	17	\$16.23	Draws
Ca	6	\$24.57	Coordination	FF3	17	\$16.23	Various
Ca	3	\$24.57	Maps, Running routes	FF3	23	\$16.23	Indexing
Ca	16	\$24.57	Site Plans	FF3	23	\$16.23	Draws
Ca	16	\$24.57	Maintenance	FF3	31	\$16.23	Complex books
Ca.	3	\$24.57	Supervision and maintenance	FF3	31	\$16.23	Street maps
Ca.	12	\$24.57	Supervision	FF3	31	\$16.23	Street index
Ca.	17	\$24.57	Coordinates	FF3	33	\$16.23	Box book
Ca.	17	\$24.57	Verifies	FF3	33	\$16.23	Street maps
Ca.	17	\$24.57	Facilitator	FF3	40	\$16.23	Index
Ca.	18	\$24.57	Draws	Lieut.	6	\$21.69	Coordination, drawer
Ca.	26	\$24.57	Some map updating	Lieut.	12	\$21.69	Running routes
Ca.	33	\$24.57	Street index	MF	20	\$20.21	All
FF2	6	\$13.20	Drawer, Binder	MF	10	\$20.21	All
FF2	6	\$13.20	Binders	MF	1	\$20.21	All
FF2	17	\$13.20	Draws	MF	1	\$20.21	All
FF3	1	\$16.23	All	MF	4	\$20.21	Draft
FF3	4	\$16.23	Rough Draft	MF	7	\$20.21	In charge of all
FF3	4	\$16.23	Riding Area	MF	3	\$20.21	Maps, Running routes
FF3	4	\$16.23	Binder Maintenance	MF	5	\$20.21	Draftsman
FF3	6	\$16.23	Binders	MF	9	\$20.21	Draws
FF3	3	\$16.23	Maintenance	MF	18	\$20.21	Maintains books
FF3	11	\$16.23	Maintenance	MF	23	\$20.21	All
FF3	11	\$16.23	Maintenance	MF	26	\$20.21	Index and draws
FF3	13	\$16.23	Draws	MF	31	\$20.21	Complex books
FF3	19	\$16.23	Draws	MF	31	\$20.21	Street maps
FF3	8	\$16.23	Draws	MF	31	\$20.21	Street maps
FF3	8	\$16.23	Draws	MF	33	\$20.21	Street index
FF3	8	\$16.23	Maintains books	<div>Note: Hourly rates are based on the mid level of the pay grade</div>			
FF3	8	\$16.23	Maintains books				
FF3	8	\$16.23	Lake Forest book				
FF3	24	\$16.23	All				

APPENDIX H - Needs Spread Sheet

Sheet1

Primary Mapping Needs	Secondary Needs	Tertiary Needs	Translation
1. Address/Hundred block issues for all streets, labeling each hundred block, the split at intersections and address for each property in rural areas.			
2. Fire hydrant locations with a label of the closest street address.			
3. Location of all static water sources.			
4. Index grids			
5. Building footprint or outline. [Need to establish a specific criteria for what buildings are included].			
6. Special hazards indicated for buildings. [Need to establish a specific criteria for what buildings are included].			
7. Label indication and footprint for major buildings, including schools, churches, shopping, etc.. [Need to establish a specific criteria for what buildings are included].			
8. Establish an easily readable scale, including font style and size. [Two of the papers reviewed indicated a scale of 1" = 400', also these references used 8 1/2 X 14 binders].			
9. Use of color printing for coding common objects such as hydrants, knox boxes, sprinkler and standpipe connections, etc. In addition color should be used to offset address range when a complex structure development is mapped such as garden apartments,			
10. Place an identifier in the macro view of a map to link the spot to complexes or other areas which would require a closer more detailed view. These details may be in the form of a window on the side of the page, or another map page.			

APPENDIX H - Needs Spread Sheet

Sheet1

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11. Labeling of longitude and latitude for use with GPS receivers and reference for helicopter landings, etc.. [GPS in the creation of maps is an area which will require more study].			
12. Symbols to show location of various items of interest to the fire and rescue members, such as knox boxes, utility shutoffs, fire department connections, fences and gates, access, bridges, rail grade crossing, etc..			
13. Standard direction orientation on every map. All maps should be formatted so that as you open the book north will always be at the top of the page. A compass rose will be conspicuous showing the north direction.			
15. Indicate roadway differences by line thickness. Show median strips and median breaks on divided highways. Provide details of freeway interchanges, as well as access to through lanes and collector and distributor lanes.			
16. Use overlap and provide an indication of adjoining map areas. Reference to literature review papers indicated that a 5% overlap was appropriate. [This will require further study].			
17. Provide prompts as needed for water supply considerations, such as, where a split lay is needed, distance between hydrants, etc..			
18. Indicate when streets are one way, also provide a symbol for traffic calming (speed bumps) devices.			